FATE OF SEDIMENTS AND ASSOCIATED FECAL-BORNE BACTERIA ENTERING GREAT BAY

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Descriptors: Water quality management; bacteria; suspended sediments; sedimentation; contaminant transport; pollutants; estuaries.

Problem and Research Objectives:

The purpose of this study was to assess the fate of microbial contaminants in waters entering Great Bay and to determine the significance of natural deposition and re- suspension processes on microbial-based determinations of water quality. The specific objectives were:

- Determine suspended sediment and microbial contaminant inputs and losses within the Squamscott River tributary/Great Bay
- Determine relationship between microbial contamination of surface Bay water with episodic rainfall/runoff and wind event re-suspension of sediments
- Compare historical deposition of microbes at sites differing in proximity to source of suspended sediments
- Determine the efficacy of using newly developed methods for detecting the DNA of specific pathogens in estuarine water and compare levels of specific microbial pathogens to levels of microbial indicators in estuarine shellfish-growing waters

Principal Findings and Significance:

Analysis of water samples collected along a transect from the Squamscott River to Adams Point in Great Bay showed that levels of both fecal-borne bacterial contaminants and suspended sediments decreased as the water from the Squamscott River flowed into a channel and into the middle of Great Bay. This trend was most striking for C. perfringens, which appears to be quite tightly associated with suspended particles. The channel in which indicator levels decreased is also the general area of the turbidity maximum for that portion of the estuary. The Lamprey River was found to be a major source of contamination, higher than previously determined from past studies.

The mechanism of sedimentation of particle-bound fecal bacteria was suspected to be associated with water flow through the extensive eelgrass beds of Great Bay. A site was chosen that had water flowing perpendicularly across a large, dense eelgrass bed from near the confluence of the two main channels of Great Bay following slack low tide. Samples were collected along a transect from the channel outside the bed to the edge of the bed to inside the bed to far inside the bed. The main target bacterial indicator was C. perfringens, which was found to be almost exclusively associated with suspended particles (~90% of total cells in the water column). Results showed a decrease in C. perfringens levels as water flowed across the beds. Sediment traps were set up to collected suspended sediments at two depths at the same four sites in and around the eelgrass beds. Results for sediment analysis and C. perfringens levels in the trapped sediments showed differing levels of sediment at different depths, depending on where in the bed the samples were taken. There appeared to be an increase in levels at the edge of the bed, a transitional zone that may have caused disturbance of sediments from in and outside of the eelgrass beds.